AD-A259 854

(2)

Special Report
CMU/SEI-92-SR-1

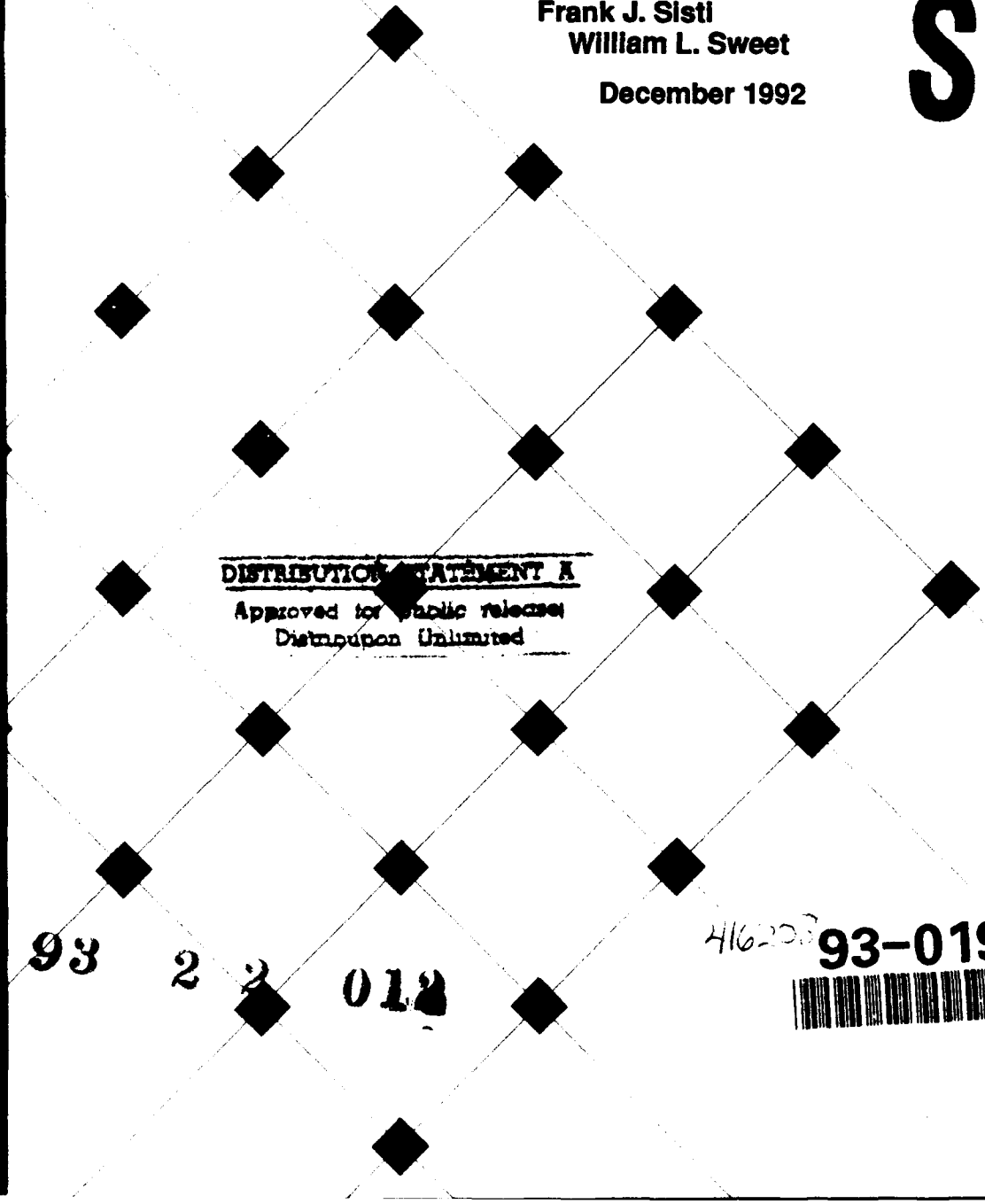
Carnegie-Mellon University
Software Engineering Institute

Report on Senior Executive Seminars on Software Issues

Frank J. Sisti
William L. Sweet

December 1992

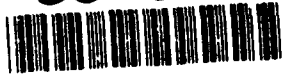
DTIC
S ELECTE D
FEB 3 1993
C



DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

93 2 2 012

93-01900



18pd

Carnegie Mellon University does not discriminate and Carnegie Mellon University is required not to discriminate in admission, employment or administration of its programs on the basis of race, color, national origin, sex or handicap in violation of Title VI of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 or other federal, state or local laws or executive orders.

In addition, Carnegie Mellon University does not discriminate in admission, employment or administration of its programs on the basis of religion, creed, ancestry, belief, age, veteran status, sexual orientation or in violation of federal, state or local laws, or executive orders. While the federal government does continue to exclude gays, lesbians and bisexuals from receiving ROTC scholarships or serving in the military, ROTC classes on this campus are available to all students.

Inquiries concerning application of these statements should be directed to the Provost, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, Pa 15213, telephone (412) 268-6684 or the Vice President for Enrollment, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, Pa. 15213, telephone (412) 268-2056.

Special Report
CMU/SEI-92-SR-1
December 1992

Report on Senior Executive Seminars on Software Issues

Frank J. Sisti
William L. Sweet

Program Development Division

Accession For
NTIS GRA&I ☑
DTIC TAB ☐
Unannounced ☐
Justification
By
Distribution/
Availability Codes
Avail and/or
Dist Special
A-1

DTIC QUALITY INSPECTED 3

Approved for public release.
Distribution unlimited.

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213

This technical report was prepared for the

SEI Joint Program Office
ESC/AVS
Hanscom AFB, MA 01731

The ideas and findings in this report should not be construed as an official DoD position. It is published in the interest of scientific and technical information exchange.

Review and Approval

This report has been reviewed and is approved for publication.

FOR THE COMMANDER

Thomas R. Miller, Lt Col, USAF
SEI Joint Program Office

The Software Engineering Institute is sponsored by the U.S. Department of Defense.
This report was funded by the U.S. Department of Defense.

Copyright © 1992 by Carnegie Mellon University.

This document is available through the Defense Technical Information Center. DTIC provides access to and transfer of scientific and technical information for DoD personnel, DoD contractors and potential contractors, and other U.S. Government agency personnel and their contractors. To obtain a copy, please contact DTIC directly: Defense Technical Information Center, Attn: FDRA, Cameron Station, Alexandria, VA 22304-6145.

Copies of this document are also available through the National Technical Information Service. For information on ordering, please contact NTIS directly: National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Copies of this document are also available from Research Access, Inc., 3400 Forbes Avenue, Suite 302, Pittsburgh, PA 15213.

Use of any trademarks in this report is not intended in any way to infringe on the rights of the trademark holder.

Table of Contents

1 Initial Actions 1
2 Actions In 1990 1
2.1 Seminar Intent 2
2.2 Accomplishments 1990 3
2.3 Seminar Conclusions 1990 4
2.4 Establishing Realistic Requirements 5
2.5 Defining Requirements 5
2.6 Software Acquisition Process 6
2.7 Metrics 6
2.8 Work Breakdown Structure (WBS) 7
2.9 Simulation and Prototyping 7
2.10 Software Productivity 7
2.11 Commercial-Off-the-Shelf (COTS) Software 8
2.12 Separate Independent Verification and Validation (IV&V) Contractor 8
2.13 Support of Universities 8

3 Transition 11
3.1 Recommendation 11
3.2 Redirection of Effort 11

4 Software Action Plan (SWAP) 13
4.1 SWAP Candidate Actions 13
4.2 Synergy Between the SWAP and the Senior Executive Seminar Participants 13
5 The Future 13

Report on Senior Executive Seminars on Software Issues

Abstract: This report expands on the activities executed by the Software Engineering Institute (SEI) associated with raising the software issue awareness of senior executives in the three principal constituent areas of the SEI: senior defense officials, industry executives, and senior academic personnel. In planning for and executing these activities, the SEI has responded to one of the principal aspects of its charter, which is to address the most important software-related issues applicable to the Department of Defense (DoD) and the software industry in the United States.

1 Initial Actions

In 1988, the SEI decided to provide a forum in which major software issues could be addressed. Thus, a workshop was held during the last quarter of calendar year 1988. The Workshop on Executive Software Issues was held in two parts: August 2–3 and November 18, 1988. A full discussion of these software issues resulted in SEI Technical Report, CMU/SEI-89-TR-6, published in January 1989. The topics addressed at this workshop centered on three major categories: national strategy, acquisition, and building large complex systems. The identified issues and recommendations were extensive in their scope and underlined the fact that there was no forum or mechanism through which such issues could be developed further and, ultimately, addressed within the DoD. The technical report, however, did serve as a record for the three constituencies of the critical dialogue required to finally address such issues raised at the workshop.

2 Actions in 1990

Late in 1989, a different approach was developed to continue with the thrust of the original workshop. This approach would avoid the constraints that resulted from the broad scope of the issues developed in the initial workshop. The new approach of the SEI resulted in a plan for a continuing series of seminars for senior executives in industry and the DoD. These seminars were to expand the work done in 1988, yet develop results that would be more usable by the DoD. This redirection of effort was an evolutionary process that occurred during the course of the year and was the direct cause of the supporting workshop that was held in late 1990.

Participation in the three planned seminars was focused on senior executive levels: chief operating officers (associated with software issues) of major defense industry firms, general officers concerned with acquisition and maintenance of software within the uniformed services, and participants from the top levels of the Office of the Secretary of Defense who had software management as one of their principal responsibilities. As in the 1988 workshop, one of the primary purposes of these seminars was to "demystify" the world of software management for these senior individuals, who had spent much of their professional careers managing hardware and now found themselves in the midst of major software developments, either in the role of procurer or developer.

Although this purpose subsequently evolved into one of clarifying specific high-leverage software issues, as will be discussed later, the primary objective of sensitization affected all later plans and the execution of the series of Senior Executive Seminars that followed.

The seminars were designed to encourage an informal sharing of experiences at each of the represented organizations so that participants would realize that all had experienced "dismal failures" and "shining successes." Participants then attempted to identify the underlying causes for the good and the bad performances. Three separate seminars were held: (1) January 25–26, 1990, at Duke University in North Carolina for east coast industry executives, (2) May 9–10, 1990, in Scottsdale, Arizona for west coast industry executives, and (3) September 5–6, 1990, at Duke University in North Carolina for DoD senior executives. Following these meetings, a workshop was conducted at the SEI (November 27–28, 1990) to address the high-leverage aspects of the most common software issues identified in the previous seminars. Finally, a joint seminar was held in Reston, Virginia (December 6–7, 1990), to address the results of the previous seminars and the outcome of the November workshop.

The concept of these efforts was that DoD concerns associated with the development of software would be solicited from the DoD and relayed by the SEI to the industry participants in the initial two seminars, and the industry concerns about software development would be developed in these two meetings. The SEI would then convey the industry concerns to the DoD in the third meeting. These meetings were informal in nature, with no formal presentations, and aided by a peer facilitator to keep the discussions flowing and focused. The workshop was designed to provide further clarification on the issues that were raised in the first three seminars, and the results of that workshop were aimed for presentation at the final (joint) seminar held in December.

The participants described the meetings as being very worthwhile and suggested that future meetings would provide a forum for individuals to meet and discuss the formulation of policies for acquisition of major software systems.

2.1 Seminar Intent

The original intent of the seminars was to take the mystery out of software programs from a management point of view by acquainting the senior managers with some of the concerns of software people and by showing, through shared experiences, that software programs could be managed at senior levels in virtually the same manner as hardware programs.

An additional intent was to help address the concern stated by some DoD representatives that senior industry leaders were not sufficiently involved in their software programs to ensure success. Software content has grown to the point that it often costs more than the hardware portion of large system development contracts. A heightened awareness of the significant software content in virtually all major DoD procurements might result in greater involvement at senior management levels and, therefore, in better performance on software contract obligations.

It was anticipated that by conducting the seminars, the SEI could promote more effective development of software-critical defense systems on time and within budget. As noted earlier, the seminars were conducted in an informal environment in which participants were encouraged to share their experiences managing software programs and to discuss DoD policy issues that may help or hinder software development and delivery. The SEI seminars drew out the views of the participants on constructive actions that the DoD policymakers could take to improve the development process and software acquisition policies. The SEI then provided the mechanism to relay these issues and suggested actions to the DoD policymakers in the third seminar.

2.2 Accomplishments 1990

The seminars were viewed as being very valuable—so much so that, after the third seminar and at the suggestion of the participants, a fourth meeting was scheduled that was a joint DoD/industry seminar where issues and views could be discussed directly between the DoD and industry representatives under the auspices of the SEI. A synopsis of the key points that came out of the first three meetings is in Appendix A. A weighted list of these points as viewed by the participants at the three seminars is in Appendix B. A listing of the attendees at each of the first three seminars is in Appendix C.

Appendix A provides insight into the issues concerning management from both the industry and DoD perspectives. One of the most striking facts is that these issues are quite similar across the spectrum of participants, as shown in Appendix B. The differences, if any, lie mainly in the approach to resolving those issues. Although the perspectives were somewhat different, often the suggested solutions were very similar. These facts lead to the conclusion that there is considerably more common ground than might be expected among the major constituent groups for arriving at joint solutions to the issues —providing a mechanism can be found for DoD and industry executives to work together.

It was recognized that much thought and effort had been previously spent in trying to resolve most of the issues that were discussed at the seminar; however, it was apparent that much of the effort had been fragmented, with each organization going its own way to find a solution. It was felt that a coordinated effort among the various Services of DoD, the various industry associations, and various industry companies could arrive at workable—and efficient—solutions to these issues. Several approaches were discussed, but no final approach was selected.

As noted in Appendix A, the issues upon which there was consensus were:

- Requirements definition.
- Realistic expectations of cost, schedule, and system performance.
- Government program management capability and continuity.
- Software evolution on a planned basis.
- Use of commercial off-the-shelf (COTS) software.

- Software-related metrics.
- Procurement methods such as cost plus award fee contracts.
- Post-delivery performance incentives on software.
- Support and guidance for universities.
- Software work breakdown structures.
- Continued investment in productivity improvement.
- Shared responsibility between industry and government for the "problem" and the "solution."

Some of these issues are normally worked on at lower levels within various organizations, but many are items that can only be resolved by senior management. It was felt that these seminars had created an awareness in the minds of the attendees of the criticality of the issues that would promote timely, lasting solutions.

Of particular interest to the attendees were the handouts that provided specifics that they could take from the meetings and use in their offices. One such item, Appendix D, was the table of software development difficulties. This chart laid out the "root" causes, common problems, and the symptoms of poor software development performance. It was identified that too often, all a manager sees are the symptoms and problems—never arriving at the root causes for these. With this chart, managers can identify the root causes and solve the problems in their organizations as opposed to treating the same symptoms over and over.

Appendix E lists five major risk areas for software projects. Understanding that these are the areas of risk most likely to occur in a program helps managers to ask specific questions to determine if the risk applies to their project. Moreover, if the risk does apply, such knowledge will ensure that appropriate steps are taken to mitigate or eliminate the risk. While these risks apply to hardware programs also, the second page of Appendix E articulates some specific software risks that fall out of the major risk areas.

Appendix F provides a list of suggested questions for the senior executive to ask a software manager to determine the competence of the software department to handle major programs. Appendix G provides a list of questions to ask program managers to determine the status or "health" of individual programs under development. These lists provide points of departure for an organization to raise the visibility of software issues within systems development and maintain adequate effort to ensure correct software development.

2.3 Seminar Conclusions 1990

The conclusions discussed herein may repeat some of the points noted earlier; however, it is felt that repetition is warranted to present all of the significant findings in one section of this special report.

First, it is worth noting that the concerns and issues expressed in the various seminars were very similar and many of the suggested solutions also were similar. This fact provides a basis for the expectation that usable, lasting solutions can be found. The following discussions summarize the key software issues derived from the 1990 Senior Executive Seminar Series.

2.4 Establishing Realistic Requirements

All participants agreed that this issue was one of the basic causes for contractor performance not measuring up to government expectations and, in many cases for not complying with contract requirements in terms of cost and schedule. The source of the problem stems from naive planning and, occasionally, political overrides. The government seminar participants felt that an adequate review of the draft request for proposal (RFP) should provide the means to correct any lack of realism that it may contain. Contractor participants felt the government did not want nor would they accept comments aimed at realism and as long as at least one contractor responded back with the "party line," no changes would be made. Suggested solutions included:

- Contractually augment the procurement team with sources of expertise—people who have done similar work.
- Open up the interactions between government and industry prior to, during, and after preparation of the RFP—don't allow inputs for more realistic objectives to go unheeded or the comments to be used against the contractor in subsequent competitions.
- Develop better—realistic—measures of performance based on past history, meaningful metrics, and better estimating models, and increase emphasis on past performance and credibility in source selection.

2.5 Defining Requirements

It was noted "that software systems seldom fail to comply with the contract but almost never meet what they are supposed to do." This is probably an overstatement but it does show the frame of mind of the participants. The concern stems from the fact that software requirements are generally not defined until late in system development. The software is usually expected to make up for deficiencies in the selected hardware suite and, therefore, requirements continue to evolve throughout system development. Further, and perhaps most critical, the users are isolated from the system developer in fear of "creeping enhancement growth" of the system. Suggested solutions included:

- Ensure that the Defense Acquisition Board (DAB) process has full visibility into planned programs, including a software risk assessment.
- Provide for user involvement at major reviews and throughout the development cycle to ensure a "shared vision" of the product.

- Provide for simulation and prototyping to improve visibility into the system capabilities.
- Take advantage of software's inherent easy modification and evolution capability by defining block upgrades of the system in a preplanned product improvement approach.
- Ensure that the operations concept of a system is included as part of the RFP.

2.6 Software Acquisition Process

Current acquisition practices are based on hardware models and do not lend themselves to software procurements. There is a need to recognize early in a system development what the degree of software content will be in the system, using systems engineers who are versed in software and hardware capabilities. Early recognition of the degree of cost and scheduling risk inherent in the software portion of the system is critical to realistic acquisition plans. An understanding of overall life-cycle implications is very important. Suggested solutions included:

- Use incremental acquisition—longer term contracts that allow incremental builds and delivery of software systems.
- Use cost-type contracts, preferably cost plus award fee, for software development and, if appropriate, firm fixed price contracts for the hardware portion of the system (some government people felt these contracts could go to separate contractors, while the industry people generally felt this would be inefficient and result in much finger pointing and litigation).
- Establish explicit software-related criteria for award fee determination, possibly even including post-delivery awards on performance; and recognize the peculiarities of software versus hardware in the scheduling of major milestones such as preliminary design review, critical design review, etc.

2.7 Metrics

This issue resulted in heated discussion. Some participants felt that good metrics were available but were not being used properly, while others felt current metrics were useless. It was finally agreed that something must be done and "metrics" would best be served if there were a joint DoD/industry effort. Inadequate and inconsistent data exist for predicting and assessing software cost, schedule, and quality. The suggested solution involved a joint DoD/industry working group to identify minimal system management needs and a metric set that would allow procurement and development people to know where they are in the real status of software programs. This working group should be under the auspices of the SEI.

2.8 Work Breakdown Structure (WBS)

Current WBS direction allows a single block for the software portion of total system development. It was felt that this did not give proper emphasis nor visibility to the magnitude of the software effort. A detailed software WBS is required to record actual person-hours for software development. Some of the ongoing efforts in this area were recognized but participants felt these would be "too little, too late." The suggested solution was a joint DoD/Industry working group to work closely with the metrics effort to define a WBS that would support the collection of data needed to provide meaningful management decisions and to support the identified metrics. The WBS should take the development of software through the various steps from inception to final test with the hardware suite.

2.9 Simulation and Prototyping

Most of the discussion on this issue centered on the cost involved in a formal simulation and prototyping program and whether or not it would save money in the long run. Almost all of the participants agreed that such a program went a long way toward reducing risk in software development; however, they were unanimous in saying that money is seldom, if ever, forecast or budgeted on the government side for this purpose. Therefore, the contractors do not propose the approach because it would make them noncompetitive from a cost point of view. Suggested solutions included:

- Incorporate requirements for simulation and prototyping in the RFPs, where appropriate.
- Include cost and schedule implications in the budgeting process.
- Formalize the prototyping process; and increase government and industry expertise to institutionalize the requirement.

2.10 Software Productivity

This issue received more discussion than any other subject because it was felt to be so necessary, yet so hard to define. The productivity of individual, acceptable coders may vary by factors of 30 to 50 times when efficiency of the produced code is considered. Also the capital investment required to improve the software development environment may be very large. The state of the art is changing so rapidly that initial investments may be wasted. Suggested solutions included:

- Support and expand industry/government process improvement programs.
- Modify the SEI assessment questionnaire to include more emphasis on productivity.
- Develop a strategy that enhances development of software support environments.
- Use the Army Materiel Command process improvement program as a model for estimating workload and required resources.

2.11 Commercial-Off-the-Shelf (COTS) Software

Industry is very interested in using COTS software to obtain competitive advantage. However, the legal and support limitations do not always make it cost-effective nor appropriate for DoD programs. The barriers to using COTS need to be identified and draft language is needed for DoD regulations that will address these barriers and make them less onerous. Suggested solutions include.

- Specify where and how COTS is to be applied in the RFP.
- Review appropriate regulations to insert COTS requirements.
- Work with commercial software vendors to encourage their permitting use of their software, including a reasonable set of DoD acceptable documentation for COTS use.
- Develop regulations that deal equitably with the liabilities associated with COTS use from the viewpoint of the government, the prime contractor, the subcontractor, and the COTS software vendor.

2.12 Separate Independent Verification and Validation (IV&V) Contractor

This issue was brought up by some of the government participants. They felt that separate IV&V contractors were neither cost-effective nor resource-effective and that the development contractor should perform this function as a matter of routine and good business practice. Quality must be "engineered into the system not forced in by threat of an IV&V policeman." Suggested solutions include:

- Moving from separate IV&V to an internal audit function, followed by moving from an audit function to process and related metrics.
- Application of total quality management (TQM) techniques would be most beneficial.

2.13 Support of Universities

Although there were no suggested solutions, the participants were unanimous in expressing the need for much closer cooperation with universities. This cooperation would include such items as increased involvement by industry in shaping the curriculum for software professionals. It was felt that universities are not turning out graduates who are useful in the defense industry without a great deal of training by industry or the DoD. The Ada culture should be promoted at the university level. While there was consensus on the need for more industry involvement with academia, the discussed solutions varied, because each organization's involvement tends to reflect the personal interest of the most senior management.

Appendix A is a more complete listing of the issues, concerns, and suggested solutions. Additionally there were a number of actions or studies suggested to be undertaken by the

SEI with support from the DoD/industry organizations. These are also itemized in Appendix A. These suggestions are under review by the SEI for appropriateness and availability of resources.

3 Transition

The 1990 sessions focused senior management attention on major software issues that are long standing and have not been resolved. They provided the participants with a fuller appreciation of the complexity of the issues and the time required for solutions. Support was offered by the participants to drive toward acceptable solutions. A strong suggestion was made and seconded by all participants that the forum and mechanism suggested by the SEI should be pursued. This included the general agreement that the SEI should continue with annual or semiannual meetings, with the same set of participants, with the goals of monitoring progress toward issue solutions, identifiying new issues, and assigning responsibility for action items.

3.1 Recommendation

On January 21, 1991, the Director of the SEI forwarded a letter to the Deputy Secretary of Defense explaining the software issues that the Senior Executive Seminars of 1990 had identified. The letter also identified a proposed forum and structure of a mechanism to continue to identify and address such issues. The momentous events of Operation Desert Storm and the reorganization of the Office of the Secretary of Defense (OSD) led to the action of execution of this forum and mechanism to be placed in abeyance awaiting clarification from OSD.

3.2 Redirection of Effort

On February 13, 1991, the Director of the SEI forwarded letters to the Senior Executive Seminar participants that explained the delay in the institution of the proposed forum and mechanism. This letter also marked the beginning of clarification being made available from OSD of where the focus would reside concerning software issues. In May 1991, the responding letter to the letter sent to Deputy Secretary Atwood was received at the SEI. In this letter, Dr. Hertzfeld (then DDR&E) stated that elements within OSD had been reviewing the issues raised by the SEI letter and various OSD mechanisms were being studied that could best accomplish the goals outlined in the letter. With this response, it became apparent that the OSD was pursuing steps that would help address the basic goals of the Senior Executive Seminars of 1990.

On June 1, 1991, the SEI established a presence in Washington, D.C., with the direct charge to assist in the completion and production of the DoD Software Technology Strategy (SWTS). This same presence was established as the Secretariat of the newly established DDR&E Software Action Plan (SWAP) Working Group.

4 Software Action Plan (SWAP)

On June 4, 1991, Mr. Charles E. Adolph, the acting DDR&E, signed a memorandum addressed to Assistant Secretary of Defense (Command, Control, Communications, and Intelligence,) and the Service Acquisition Executives, initiating the DDR&E Software Action Plan (SWAP). This memorandum also instituted a working group charged "to develop and lead the implementation of an integrated technology and management plan to ensure more cost-effective software, software support, weapons systems, and related test equipment systems within the DDR&E purview."

4.1 SWAP Candidate Actions

In building a candidate actions list to be addressed in the SWAP-Working Group, focus was placed on actions with high leverage on software development and acquisition throughout the DoD. As a critical input to the creation of this candidate actions list, the recommended actions from the 1990 Senior Executive Seminar Series were addressed. Appendix H is the initial list of the accepted Candidate Actions that the SWAP-Working Group has begun to review.

4.2 Synergy Between the SWAP and the Senior Executive Seminar Participants

As an example of the impact that the Senior Executive Seminar Series has had in the SWAP Working Group candidate action number 003 software cost reporting standards, which represents the first example of close synergy between the work done under the auspices of the SWAP and the industry representatives who had participated in the 1990 Senior Executive Seminars. In searching for answers posed by senior OSD officials concerning the impact of instantiating software cost reporting standards in the software industry, the participants in the 1990 Senior Executive Seminars were polled by the director of the SEI to request knowledgeable people who could participate in a sub-work group to discuss this issue and develop responses to the OSD questions. This work group met during the 1991 SEI Software Engineering Symposium on August 27, 1991. The result's of the sub-work group's deliberations were provided to the SWAP-Working Group and then forwarded to the cognizant OSD official. These responses were instrumental in the overall decision by OSD concerning the institution of such standards. Such synergy continues on an issue-by-issue basis and is based on OSD concerns and funds available.

5 The Future

The originally proposed mechanism for the critical interchange between senior executives in industry, the DoD, and academia is directly related to the transition element of the SEI charter. With the establishment of the DDR&E SWAP Working Group, the OSD segment

of the mechanism is being developed. Current re-focusing of responsibilities within OSD, associated with software issue identification and resolution, will provide a clearer process which can then act as the basic building block for the forum and mechanism found in paragraph 1.3.2. The SEI remains committed to supporting a realistic mechanism that serves the purpose of opening the critical dialogue between the three constituent groups. The SEI, as a federally funded research and development center charged with software-related issues, is superbly placed to provide the synergistic element that will assist in addressing these critical software issues.

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS None
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release Distribution Unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) CMU/SEI-92-SR-01	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Software Engineering Institute 6b. OFFICE SYMBOL (if applicable) SEI	7a. NAME OF MONITORING ORGANIZATION SEI Joint Program Office
6c. ADDRESS (city, state, and zip code) Carnegie Mellon University Pittsburgh PA 15213	7b. ADDRESS (city, state, and zip code) ESC/AVS Hanscom Air Force Base, MA 01731
8a. NAME OFFUNDING/SPONSORING ORGANIZATION SEI Joint Program Office 8b. OFFICE SYMBOL (if applicable) ESC/AVS	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F1962890C0003
8c. ADDRESS (city, state, and zip code)) Carnegie Mellon University Pittsburgh PA 15213	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO: 63756E; PROJECT NO.: N/A; TASK NO: N/A; WORK UNIT NO.: N/A
11. TITLE (Include Security Classification) Report on Senior Executive Seminars on Software Issues	
12. PERSONAL AUTHOR(S) Frank J. Sisti and William L. Sweet	
13a. TYPE OF REPORT Final 13b. TIME COVERED FROM TO	14. DATE OF REPORT (year, month, day) December 1992 15. PAGE COUNT 14 pp.
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (continue on reverse of necessary and identify by block number)
FIELD	GROUP	SUB. GR.	acquisition; large complex systems; national strategy; productivity; requirements definition; software issue

19. ABSTRACT (continue on reverse if necessary and identify by block number)

This report expands on the activities executed by the Software Engineering Institute (SEI) associated with raising the software issue awareness of senior executives in the three principal constituent areas of the SEI: senior defense officials, industry executives, and senior academic personnel. In planning for and executing these activities, the EI has responded to one of the principal aspects of its charter, which is to address the most important software-related issues applicable to the Department of Defense (DoD) and the software industry in the United States

(please turn over)

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ■ SAME AS RPT ☐ DTIC USERS ■	21. ABSTRACT SECURITY CLASSIFICATION Unclassified, Unlimited Distribution
22a. NAME OF RESPONSIBLE INDIVIDUAL Thomas R. Miller, Lt Col, USAF	22b. TELEPHONE NUMBER (include area code) (412) 268-7631 22c. OFFICE SYMBOL ESC/AVS (SEI)

ABSTRACT — continued from page one, block 19